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Electronic ears on alert for enemy gunshots
By Dave Moniz, USA TODAY
QUANTICO, Va. — Riding inside heavily armored Humvees, U.S. troops in Iraq have a problem that goes beyond the threats of roadside bombs and rocket-propelled grenades. It's noise.

The Army hopes the 'boomerang' will help alert troops to enemy fire.

By Brennan Linsley, AP

The inside of a Humvee is so loud that the driver and front-seat passenger often have to shout to be heard. Troops inside the boxy-looking military trucks sometimes don't hear gunshots being fired at them, even when their vehicles are winged by enemy bullets. Even when troops are aware they're under attack, they sometimes have a hard time figuring out where the shooting is coming from.

To solve these problems, Capt. Steve Philipp and his comrades at the Marine Corps Warfighting Laboratory here have spent much of the past year shooting machine guns and other weapons toward an odd-looking, flower-shaped device attached to the back of a Humvee.

The object that Philipp and others have fired at more than 4,000 times is called a "Boomerang." It's an acoustic sensor that the Marine Corps hopes will alert troops that they're being shot at and help them quickly figure out where the enemy gunfire is coming from.

Crash program

The Boomerang grew out of a program the Pentagon began in late 2003, months after the "major combat" phase of the Iraq war had ended on May 1, but at a time when it was clear that U.S. troops were increasingly at risk from a growing and aggressive insurgency. The Pentagon launched a crash effort to build a cheap and reliable sniper-detection system. There were existing gunfire detectors at the time, but the Marines thought they were expensive and in some cases too error-prone to be completely reliable.

To develop a cheap and reliable device, the Defense Advanced Research Projects Agency (DARPA), a high-tech research and development arm of the Pentagon, contracted with a private firm to create a system within 60 days, an extraordinarily short development window for a battlefield system.

The company, BBN Technologies of Cambridge, Mass., is renowned for its expertise in the field of acoustics. In 1978, Congress asked one of BBN's chief scientists, James Barger, to analyze audiotapes of President John F. Kennedy's assassination to determine how many shots were fired at him.

Just missing the tight two-month deadline, BBN developed a first-generation Boomerang in 66 days in early 2004. The Marines have used 40 of those prototypes in Iraq for the past year while BBN has been developing a more reliable second-generation system.

The clunky-looking Boomerang resembles a 9-foot-tall Tinkertoy. It employs a cluster of seven microphones to measure both the sound of the muzzle blast and the shock waves bullets make as

they zip through the air above the speed of sound. Boomerang uses sophisticated algorithms to compute what direction a bullet is coming from, and how high above the ground and how far away the shooter is, all in less than one second.

That information is displayed on a panel mounted near the vehicle dashboard. A computer-generated male voice simultaneously spits out information on the origin of the enemy fire. It will say, for example, "Shot, 6 o'clock. Shot, 5 o'clock," to alert troops that someone is firing from behind them.

Bosnian experience

The need for sniper-fire detection first came to light during the 1990s because of the United Nations' experience in the Bosnian city of Sarajevo, home to a dangerous area that came to be known as "Sniper Alley." DARPA conducted research with a number of companies, including BBN, to test stationary sniper-detection technologies.

Karen Wood, a program manager at DARPA, says BBN's previous work was the most impressive that was looked at. That led her agency in 2003 to seek out the company to develop a sensor that could be mounted on vehicles. The idea was to find a way to protect the motorized convoys and patrols frequently conducted by U.S. forces in Iraq.

The Boomerang is not the only sniper-detection system in development or on the market. There are about a half-dozen such devices now available, including ones made by French and Canadian companies. The Army and U.S. Special Operations Command began using a limited number of French-made PILAR systems in 2003.

DARPA officials asked BBN to design a new system because the agency felt affordability was important. At $65,000, the PILAR system is more than six times the cost of the Boomerang.

Scott Miller, an engineer at the Army Research Lab in Adelphi, Md., says he believes the PILAR is more accurate than the Boomerang and says the Army is happy with its performance in limited use in Iraq. The military will not discuss how or where U.S. commandos are using PILAR. Philipp, the Marine Corps officer, says he has tested all of the existing sniper-detection systems. He says that the Boomerang, which can be manufactured for less than $10,000 per copy, is as good as if not better than the others.

He says one of the other systems is particularly prone to false alarms, a problem that until recently also plagued the Boomerang. Signals from military radios, he says, had a tendency to prompt false alarms in the Boomerang because its software interpreted the radio static as gunshots. BBN engineers were able to fix that problem by tweaking Boomerang's software, Philipp says.

The Marines are now testing second-generation Boomerangs at the Quantico Marine Corps Base and at Camp Lejeune, N.C., after having worked out a number of bugs identified by Marines in the field.

"They'd say, 'I don't like this,' 'I don't like this,' 'don't like this,' " Philipp says. The second-generation Boomerang has overcome several of those complaints, he says.

Early version too wordy

One of the criticisms was an excessively wordy warning system whose voice alert said "incoming" before giving the direction of the gunfire. Marines in the field thought that extra word wasted time, even if only a second. They wanted just the direction of the shot, and right away. Another problem was that the Boomerang's software sometimes had difficulty filtering out "celebratory" gunshots, which are typically fired into the air and are not threatening.

Philipp envisions the Boomerang being used in two ways. For support troops in convoys that come under attack, it will provide warning time to escape ambushes once the first shot is fired. Combat

forces, Philipp said, can use the Boomerang "to stay and fight."

The big advantage that sniper-detection systems can bring, DARPA's Wood says, is time. In Iraq, insurgents often attack U.S. forces with AK-47 rifles, Russian-made weapons that are not precise when fired from a distance. Because AK shooters will often "walk their fire" toward the target with a series of rifle bursts, being alert to the first shots would give U.S. troops a huge advantage, she says.

"This is what I would want on every Humvee if my child was out there," Wood says.